Protein Therapy

The Clinical Use of a New Protein Preparation

ANDREW F. BURTON, M.D., Ph.D. and CHARLES R. DREW, M.D., Med.Sc.*
with the technical assistance of Johnnay Walker and Hilda L. Collins

THE problem of supplying the surgical patient with needed proteins is always a pressing one. This problem is made more difficult by the nature of the proteins themselves. They are bulky for the most part, and usually very unappetizing unless mixed with adequate amounts of fats and carbohydrates. The management of bulk in the sick patient is always a problem. This difficulty can be minimized by administering some form of concentrated protein digest. The need for an ideal, and at the same time economical protein digest, has resulted in several such compounds being prepared.

This report is concerned with a new protein digest called Zymino,** prepared by hydrolyzing casein and a minor amount of yeast with hydrochloric acid. This product is a yellowish white, moderately hygroscopic powder, practically odor-

* From the Division of Surgical Research, the Department of Surgery, School of Medicine, Howard University and the Surgical Services, Freedmen's Hospital, Washington, D. C.

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TABLE I—ANALYSIS OF ZYMINO

Moisture	3.0%
Total Nitrogen	11.5%
Amino Nitrogen (Van Slyke)	5.7%
Fat	0.5%
Ash	6.1%
Carbohydrates (by difference)	17.0%

TABLE II—AMINO ACID AND VITAMIN ANALYSIS OF ZYMINO

Amino Acids	*100% Protein Basis N — 16%*	*Vitamins*	*Micrograms per gram*
Arginine	4.0	Vitamin B_1	2.1
Histidine	2.6	Riboflavin	13.1
Lysine	6.7	Niacin	115.0
Tyrosine	6.0	Pantothenic acid	37.8
Tryptophane	1.7	Choline (ascholine Chloride)	2130.0
Phenylalanin	5.0		
Cystine	0.4		
Methionine	3.3		
Threonine	4.0		
Leucine	12.0		
Isoleucine	6.0		
Valine	6.6		

less and with a bland slightly sour taste. It is readily soluble in water and therefore can be dissolved and suspended in liquids quite easily. Its nitrogen and amino acid content, as furnished to us by the manufacturers, are listed in Table I. The product showed no signs of deterioration when kept for considerable periods of time in bulk. Table II shows this product to have all of the essential amino acids in addition to vitamins of the B complex group.

It was the purpose of this investigation to make a clinical evaluation of Zymino; first, by determining if patients could tolerate the product for long periods of time; second, the best method of administering Zymino to get the maximum cooperation from the patient, and third, through a study of blood protein levels and urinary nitrogen excretion to determine the effectiveness of Zymino in maintaining a satisfactory nitrogen metabolism.

Methods: Five children from the surgical pediatric service and one adult from the surgical service were used for this study. The children's ages ranged from 6 years to 10 years. They all wore casts or dressings that were changed from time to time. This made it impossible for us to keep a reliable record of their weight. All the children received a basic diet of 2000 calories. Each child was supervised during meal time to be sure that he consumed all of his Zymino. Twenty-four hour urine specimens were collected twice weekly and the N.P.N. determined on the pooled specimen. Blood proteins, hematocrits, white blood counts and red blood counts were done twice weekly, and on the same days that the urine N.P.N. was done. The N.P.N. and total protein were determined by the micro Kjeldahl method of Folin, Denis and Wong as described by Peters and Van Slyke.[1] Albumen was determined by the method of Howe[2]. Determinations of hematocrit levels were made on heparinized blood in Wintrobe tubes.

In the early experiments the product supplied us had a slightly undesirable taste. For this reason we were unable to give more than 25 grams per day. Later an improved practically tasteless product made it possible for us to give as much as 75 grams daily without difficulty. Due to the solubility of Zymino we found the citrus fruit juices to be the most satisfactory vehicle.

Results: The six subjects (five children and one adult) put on a diet supplemented with Zymino were able to maintain satisfactory blood protein levels with some increase over the control levels in some instances as shown in Table III.

In the case of R.P. the albumen-globulin ratio was reversed, in the beginning, however, a significant rise was noticed in the albumen fraction after 16 days on Zymino. A similar situation existed in the case of B.R. with no increase in the albumen fraction after Zymino feedings. The significance of these findings are not apparent.

Improvement in appetite was noticed in most of the patients. In the case of L. P. a gain of 11 pounds was noted in 10 days. She experienced a marked improvement in appetite and well being. The red blood counts were increased in all the cases except R. P. as shown in Table 3.

In two instances the patients complained of some epigastric pain and "gas" on the second and third days after eating Zymino. These symptons disappeared without treatment and without discontinuing the diet.

The greatest increase in blood proteins occurred while the patients were on a regular diet, with adequate proteins consisting of meats and milk, to which Zymino (42 grams) had been added.

Discussion: A more critical and quantitative evaluation of the efficiency of Zymino in maintaining positive nitrogen balance is desirable. However, in this preliminary study our physical establishment necessitated certain limitations. From these findings

TABLE III

Case	Disease	Diet	Days on Diet	Hematocrit Per cent	Total Proteins Per cent	Red Blood Count	Albumin	Globulin	Urinary Nitrogen 24 hours
R.P.	Still's disease	Control	0	37.0	7.54	4,380,000	2.66	4.88	20 gms.
		Regular with 42 gms. Zymino	16	33.3	8.7	4,360,000	2.72	5.68	18.5
		Zymino as source of protein 50 to 75 grams	29	31.8	7.9	3,918,000	3.43	4.48	4.9
K.S.	Osteomyelitis	Control	0	41.5	6.7	4,340,000	—	—	—
		Regular with 42 gms. Zymino	16	38.7	8.6	4,460,000	5.6	2.9	12.2
		Zymino as soudce of protein 42 to 50 grams	19	38.5	6.8	4,610,000	5.1	1.7	2.1
C.S.	Osteomyelitis	Control	0	36.5	6.2	4,200,000	4.3	1.9	17.2
		50 gms. of Zymino as source of protein	24	35.5	8.4	4,205,000	4.77	3.6	6.3
C.T.	Infected tendons of left leg, fracture of tibia and fibula	Control	0	33.0	7.7	3,890,000	—	—	9.1
		50 gms. of Zymino as source of protein	34	35.6	8.8	4,116,000	5.0	3.8	6.4
L.P.	1st and 2nd degree burns of chest	Control	0	38.0	6.1	4,250,000	4.3	1.8	6.8
		Regular diet with 100 gms. Zymino as source of protein	10	42.0	6.7	4,390,000	4.9	1.8	6.0
B.R.	3rd degree burns of chest	Control	0	30.0	7.4	3,650,000	2.8	4.6	—
		50 gms. of Zymino as source of protein	28	34.0	7.1	3,926,000	2.8	4.3	1.4

The figures paralleling each type of diet represent averages for the particular period that the patient was on that diet. All patients on the diets less than 30 days were discharged improved.

it is obvious that blood protein levels were maintained and improved when Zymino was added to the diet and when it was used as the main source of nitrogen. This rise in the blood proteins was real since no hemoconcentration occurred. This is shown by the hematocrit levels which were lower than the control levels in most instances, suggesting slight hemodilution instead of hemoconcentration. Improvement was noted in the red blood cell counts which might have been a result of the patient's generally improved health.

We would like to think that the high vitamin content of this preparation might have been responsible for the improvement in appetite noted in these cases. However, Kozoll, et al[2], studying the clinical effectiveness of Essenamine, a protein hydrolysate prepared from lactalbumen noted a steady improvement in appetite which they attributed to the large nitrogen retention that occurred. The role of the yeast protein in this preparation is not apparent as determined by this study. Growth tests with rats were carried out by Hoch[4], to determine to what extent animal protein could be replaced by yeast protein, found no appreciable change in growth provided no more than 50 per cent of the protein was yeast protein, 75 percent replacement reduced the gain 15 per cent to 25 percent while complete replacement resulted in 50 percent decrease in weight gain per unit of protein consumed. Klose and Fevold[5] attribute this discrepancy in growth to the inadequate amounts of methionine necessary for optimum rate of growth. In their experiments on growing chicks and rats it could be corrected by the addition of methionine and to a limited extent by cystine. Both of these amino acids are present in Zymino in adequate amounts.

SUMMARY

1. Zymino provides adequate nitrogen for maintaining nitrogen balance as shown by the general clinical improvement of the patient, the maintenance and in most cases increase in the blood protein levels.

2. Zymino is tolerated well and even requested by some patients.

3. Increased appetite and improved well-being were noted after feeding Zymino.

4. The only undesirable effect noted was some epigastric pain and "gas" in two of the cases. This occurred on the 2nd and 3rd days and subsided without discontinuing the Zymino.

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